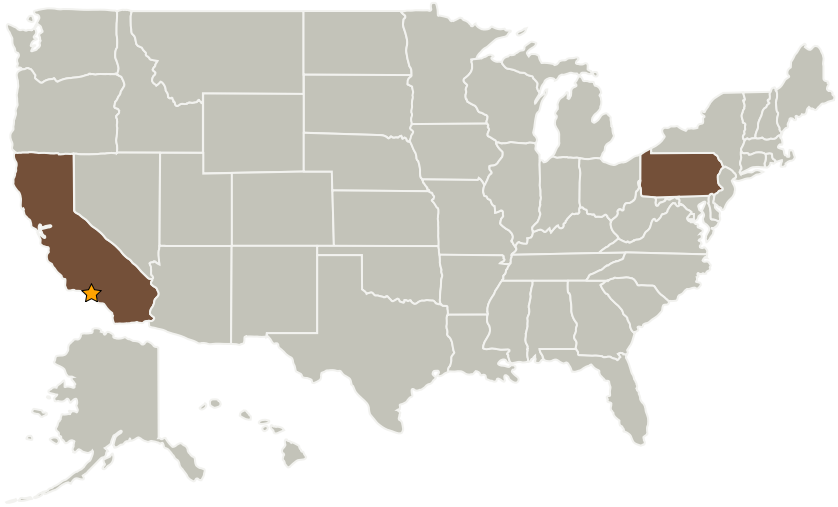
Single Crystal Piezomotor for Large Stroke, High Precision and Cryogenic Actuations, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

TRS Technologies proposes a novel single crystal piezomotor for large stroke, high precision, and cryogenic actuations with capability of position set-hold with power-off. The proposed concept will advance the state-of-art cryogenic actuations considering the excellent cryogenic properties (with d33 and d31 at 30K similar or higher than that of PZT at room temperature) and the great electromechanical coupling of single crystal piezoelectrics, and the novel design of the ?wobbling mode? piezomotor with ?33 mode? single ring stacks instead of the conventional ?31? mode plates for excitation. In the Phase I project, the cryogenic properties of single crystal piezoelectrics with various crystal cut will be investigated. FEA modeling that takes into consideration the special properties of single crystals and a cryogenic environment will be conducted and a novel piezomotor with ?33? mode single crystal ring stacks and screw driven structures will be built and characterized at temperatures from 300 to 20K. At the conclusion of Phase I program the feasibility of ? wobbling mode? piezomotor for large stroke cryogenic actuation will be demonstrated. Optimization of the single crystal piezomotor design and the development of a large aperture cryogenic mirror or reflector will take place in Phase II.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
TRS Ceramics, Inc.	Supporting Organization	Industry	State College, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Rehrig

Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic